

# solplan review

the independent newsletter of energy efficient building practice

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## INSIDE....

There are many approaches to retrofit work. The opportunity for tackling energy conservation work is easier when major renovation and repair work is contemplated. We describe what was done and what the results were of a major project that was monitored in Saskatoon. The work is much more extensive than may be appropriate for most projects, but it offers one approach.

Mario Kani offers an alternative way to build a rain screen wall that performs well and improves the insulation performance.

A major study has been underway in Atlantic Canada to determine the cause of moisture in construction. We report on preliminary study findings.

Wet basements are not a new problem. However, wet basements caused by improper insulation and finishing practices are new. This points to the importance of good building practice. We review the results of a Winnipeg study.

What is going to happen this year? We don't have a crystal ball, but a survey of delegates at the CHBA Annual Convention gives us some clues.

Other items include information on an air leak detector, humidity sampler, a book review, and on the HABITAIR integrated heating and ventilation unit.

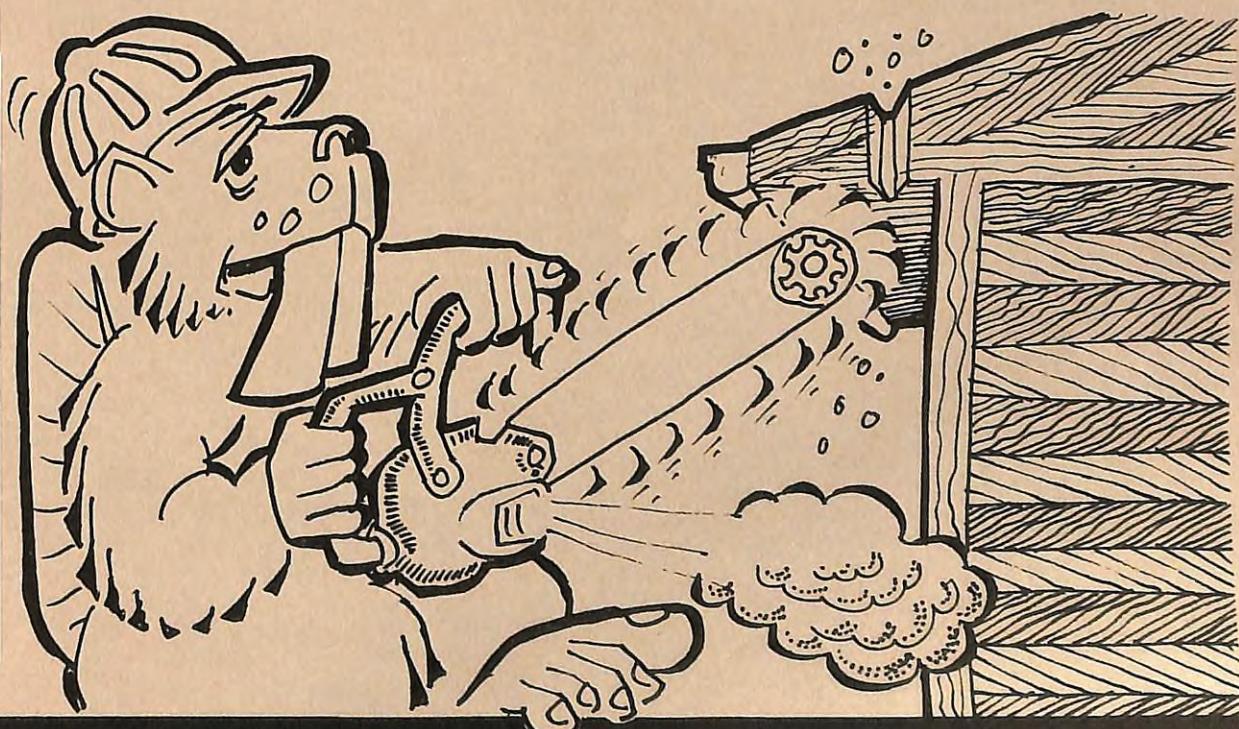
## CONTENTS

Air Leak Detector . . . . .	2
The Chain saw Retrofit . . . . .	3
Letters to the Editor . . . . .	6
Beyond The Rain Screen . . . . .	8
Moisture in Walls Study . . . . .	10
Wet Basements . . . . .	11
Book Review . . . . .	12
Industry Survey . . . . .	13
Humidity Sampler . . . . .	14
LEBCO Commentary . . . . .	14
Products: HABITAIR . . . . .	15

## THE CHAINSAW RETROFIT

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3921  
Richard Kadulski



## FROM THE PUBLISHER

As a society we are beginning to see the consequences of our wasteful lifestyle. Garbage dumps are filling up, and we are in danger of having to wallow in our own garbage. As no one wants to live next door to one, it is increasingly difficult to find a place to dispose of our wastes.

The problem is not just how to deal with the garbage we generate, but also the environmental consequences of the wastes that are part of the processes used in manufacturing construction materials.

Fluorocarbons (CFC's) are just one material that has a significant impact on the environment. It is not only used in refrigerants, but is a key component in the manufacturing process of products such as extruded polystyrene insulation. These gasses are finding their way into the upper atmosphere where they destroy the protective ozone layer.

ASHRAE (a technical organization with important industry representation) is campaigning against elimination of CFC's. They suggest that more research is needed (just like the anti-acid rain lobby?) before anything should be done.

CFC's are only a small part of the problem. Builders are becoming aware of the problems of chemically sensitive persons. For each product that is a problem, there is a factory producing a witches brew of chemicals that must be dealt with.

How many of the new synthetic products are really necessary? Is plastic made to look like marble, stone or wood better than the real thing? Is it the only way to get the desired effects? Do these products provide a significant improvement? Is it something that we can't do without? Or will the non-biodegradable wastes and cuttings just add to the mounting garbage pile?

  
Richard Kadulski  
Publisher

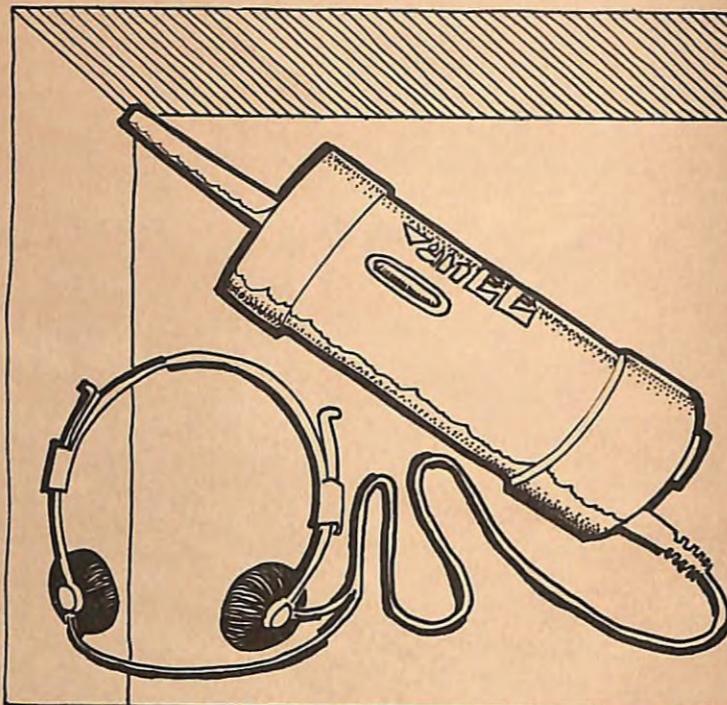
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## AIR LEAK DETECTOR



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## THE CHAINSAW RETROFIT

Renovation and Retrofitting of existing housing stock is taking on more importance to the construction industry as current housing stock deteriorates and must be upgraded. That is why monitored performance data is valuable to see how effective various retrofit options are.

A recent major retrofit of a Saskatoon bungalow built in 1968 was thoroughly documented. It offers some ideas that may be of interest to anyone planning major retrofitting of existing houses.

The house was a typical 2'x4" stud wood frame, stucco exterior, and poured-in-place, 8" thick concrete basement walls.

Energy consumption readings for the house before work started were gathered during January-April 1982. The house was not occupied during this time. The gas water heater was disconnected, and the house maintained at 21°C. The design heat loss of the house was reduced from 13.1 kW (at -34°C) to 5.45 kW by the retrofit.

In order to check whether the results achieved were in line with predictions, house energy consumption was analyzed using the HOTCAN computer program.

### THE RETROFIT

The energy conservation measures included:

1. Installation of a completely new air-vapour barrier over the walls, roof and basement walls.
2. Addition of 12" fiberglass batts to the walls, roof, and basement walls.
3. Addition of a third layer of glazing to all windows in the house.
4. Replacement of the gas furnace and water heater.
5. Addition of a controlled ventilation system using a heat recovery ventilator.

### ROOF

To provide a continuous air-vapour barrier at the junction between the wall and roof, and to avoid having to wrap the existing eaves and overhangs, the eaves, soffits and overhangs were removed. A power saw was used to cut the roof sheathing and part way through the roof eave projection



in line with the outside of the existing wall of the house.

Each section of the roof was worked on separately, to minimize rain penetration during times when the roof was without shingles.

Plywood strips were nailed over the cut ends of the roof trusses. The existing roof sheathing was covered with a single sheet of ultra-violet stabilized 6 mil polyethylene vapour barrier. 3/8" plywood strips 6" wide were nailed at 6' centers over top of the polyethylene to allow workers to stand on the roof without slipping. The strips were placed over every third roof truss.

2x8 purlins on edge were placed parallel to the long axis of the roof. These provided a cavity for insulation and support for 2x4 rafters. The 2x8 purlins were nailed against a bracket. The lowest purlin was fastened to the wooden block with galvanized iron metal straps and nails. 2x4 rafters were then placed at 16" on centre over the purlins (fig 1). A 2x6 eave board was nailed to the end of the new rafters.

Fiberglass insulation batts were then installed. 8" (R28) batts were threaded under the rafters to fill the space provided by the purlins. These were placed perpendicular to the rafters. A 3 1/2" (R12) thick batt was placed between the rafters, at right angles to the purlins to minimize continuous air gaps through the insulation. The batts were cut and fitted to fill the whole space.

Plywood roof sheathing (3/8") was nailed over the rafters.

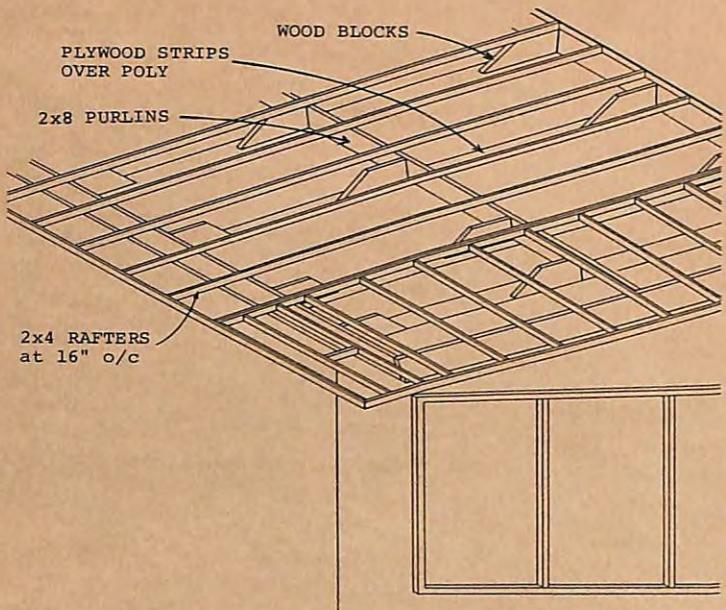


Fig. 1

Equivalent insulation could have been added to the attic at a lower cost than the exterior technique that was used. Such a job of sealing and insulating could have been done for about \$1,200, as opposed to the \$3,900 for this job. However, insulating from the inside would not have resulted in as tight a house.

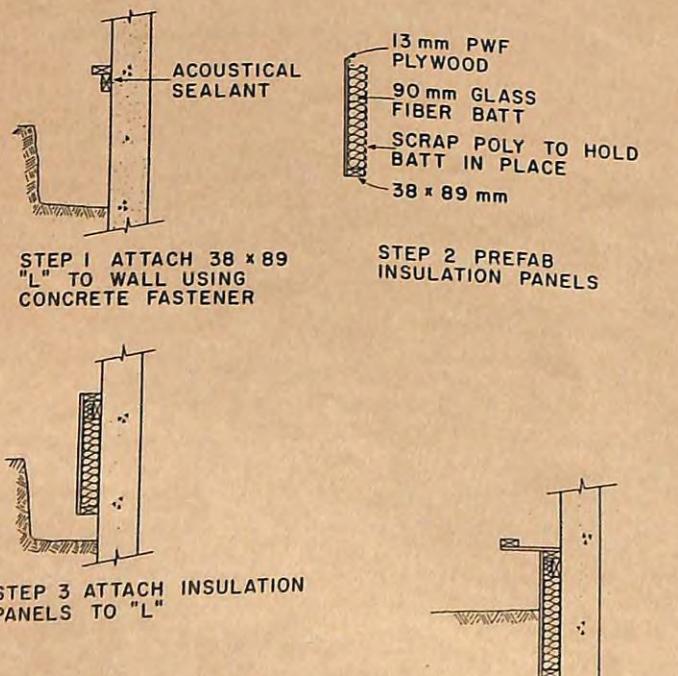


Fig. 2

But if insulating from the interior, it is important to try and be sure that the amount of insulation over the exterior wall is as thick as (or as close as possible) to the depth of insulation over the entire ceiling. If the heel space is very shallow, which is quite common in older houses, there will be considerable thermal bridging at the eaves.

Although expensive, this technique of wrapping the exterior of the roof with insulation would be an effective method of reducing air leakage and condensation in shed and cathedral roof construction where it is not possible to gain access from an attic space to execute the air tightness measures.

#### WALL RETROFIT

The existing wall was refinished from the exterior.

A continuous 6 mil polyethylene air-vapour barrier was attached to the walls over the existing wall sheathing. Vertical strips of plywood were nailed at 4 foot intervals to anchor the poly and prevent wind forces from billowing the sheets. The polyethylene was sealed with acoustical sealant at the top plate. Joints were protected with a strip of lumber nailed over the joint. The poly was also carefully sealed to the edges of all exterior door and window trim pieces and to the concrete foundation approximately 8" below the joist header.

At the lower part of the exterior wall, a pressure treated, insulated skirt was attached. A trench about 14" deep was dug to allow the skirt to be carried 12" below grade. Two pieces of 2x4 wood were nailed together to form an "L". The inverted "L" was attached to the concrete foundation walls with concrete nails. Half inch thick pressure treated plywood was cut into strips 2 feet wide and a 2x4 pressure treated piece nailed to the lower edge of the plywood. Fiberglass insulation batts were fitted to each 8 foot panel and fastened to the foundation (fig 2).

A 12" strip of  $\frac{1}{2}$ " plywood was nailed to 2x4 pieces. The plywood sealed the insulation.

A second 2x4 wall was then built out. (fig 3). The top was nailed to the sides of the new rafters. To provide additional

support for the new outer wall, a perforated metal strap (commonly used to support plumbing pipes) was then attached at 4 feet on centre. The strap was screwed first to the bottom plate and then into the wall stud on the inner wall. The strap was tightened by adding one or more screws down

Insulation batts were placed in the newly formed wall cavity; R28 batts horizontally in the wall cavity and R12 batts vertically between the uprights.

The wall was sheathed with 3/8" plywood to allow for stucco finish.

#### BASEMENT

The interior wall was strapped and insulated with 12" of fiberglass batts. (Fig 4)

The basement wall retrofit proved to be expensive, with a very high ratio of labour to material costs. This was because the basement walls already had some finishes, and there was considerable amount of ductwork and piping that had to be moved.

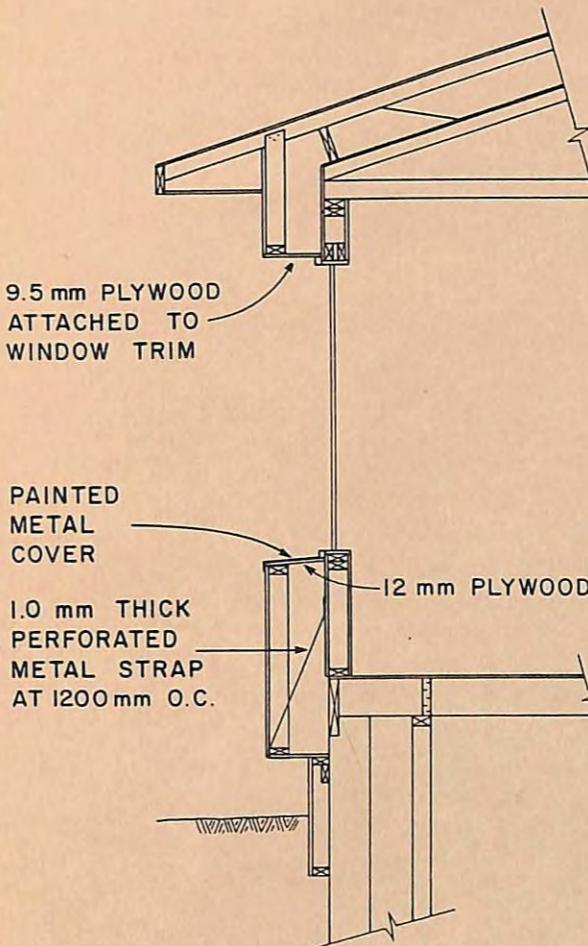


Fig. 3

from the top of the strap. Openings around the windows and doors were framed with 2x4 material and 1/2" plywood. The sill was sloped. Pressure treated plywood was used on the sills, and untreated plywood on the other three surfaces.

The windows and doors were left in their original place on the inner wall.  $\frac{1}{2}$ " plywood was used between the exterior window and door trim and the outer wall strapping. The plywood liner was covered with pre-finished galvanized metal on the sill and stucco on the remaining exposed surfaces.

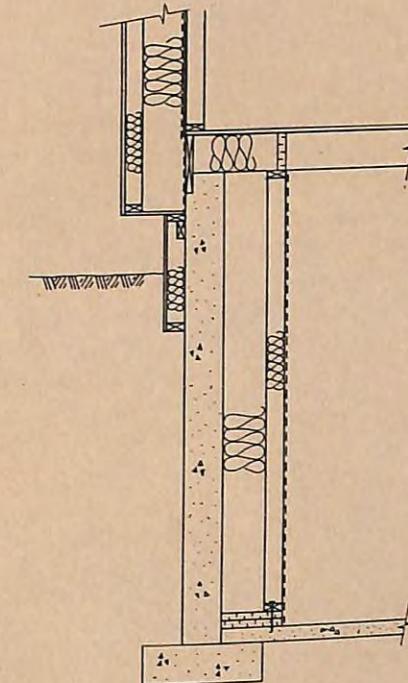


Fig. 4

#### AIRTIGHTNESS

A series of air leakage tests were made during the project, so it was possible to determine how much airtightness was contributed by different building components. The ceiling accounted for about 52% of the original total leakage area, while walls, windows and doors accounted for 48%.

The air leakage of the house as measured by a blower door was 2.95 ACH at 50 Pa

before work started. This was slightly less than the average of 3.5 ACH at 50Pa for houses built between 1960-1980 in Saskatoon (which had been studied in earlier energy performance tests of 97 Saskatoon houses). The air leakage was reduced to 0.29 ACH at 50 pascals, a reduction of 90.1%.

The technique of wrapping the exterior of the entire building with a polyethylene air-vapour barrier proved to be a very effective method to reduce air leakage. After retrofitting this house was the tightest house measured to date in Saskatchewan.

#### VENTILATION

The heat recovery ventilator installed had a maximum installed flow rate of 160 cfm, which is equivalent to 0.5 air changes per hour.

#### COSTS

As the retrofit procedure involved major alterations to the entire envelope of the structure, costs for the total retrofit were high (and this was for a house with a very simple shape). The total cost, which included upgrading the shingles and the stucco on the house, was \$23,700 in 1984 dollars. Costs related to energy conservation alone were \$17,200. Of this, roughly 50% was for labour and 50% for materials.

Without question, there are many cases where economics, based on a cost-benefit analysis, would not support the use of measures described here. A prospective user of this method should consider the cost/benefit relationship. A do-it-yourselfer who does not count labour costs may find this approach more economical.

Where retrofitting is being considered, careful consideration should be given to all circumstances. A number of factors will determine whether an approach as was done here is a viable option. Some of these are:

1. The condition of the siding and roof. If these have to be removed and replaced because they have completed their useful life, that cost should not be used in evaluating the cost assigned an energy retrofit.

2. If the heating system is to be replaced, or if the house is to be increased in size so that the

existing system will no longer be adequate, it must be remembered that an energy retrofit will influence the size and cost of a new heating system.

3. Local energy costs are important.
5. For the homeowner who wishes to provide their own labour for part or all of the retrofit, the total dollar cost would be reduced.

*The project described in this article is described in an unpublished report "A Major Energy Conservation Retrofit of a Building" by Harold Orr and Rob Dumont at the Institute for Research in Construction (NRC) in Saskatoon, Sask.*

## LETTERS TO THE EDITOR

Sir,

On behalf of Fiberglas Canada Inc., I would like to take this opportunity to comment on the article "Insulation Costs" in the December-January 1988 edition of SOLPLAN REVIEW (no. 18). The article, which I'm sure was written with the best of intentions, contains some obvious errors and omissions which may mislead your readers. Sections which warrant review include:

1. The product pricing chart for Glas-fibre, Cellulose and Mineral Wool does not include coverage at a specific R value as well as cost per R value. Given the pricing listed, you appear to be giving the Cellulose and Mineral Wool manufacturers an unfair advantage with your readers. I would suggest that you review your pricing and establish pricing on a per square foot basis at a specific R value.
2. The second chart summarizing product costs in four different trading areas also includes an error. The second

column for each trading area should be labelled \$/SQ.FT./R. In addition, Glasclad is spelled with a single s, and the thickness should be 1½".

Once again, your decision to include an article in your newsletter on Insulation Costs, specifically cost/R value, takes an excellent approach to the topic.

A.S. Molenda, Manager,  
Residential Insulation Market,  
Fiberglas Canada Inc.

You correctly point out a typographical error that escaped our notice until after the issue was in the mail. The second column for each city should have been labelled \$/SQ.FT./R.

We noted that loose fill insulation is usually supplied through insulation contractors so a 'per bag' material cost is not readily available. As you imply, different insulation products have varying densities. For an R40 coverage, the number of bags required per 100 square feet is as follows:

Fiberglass Super-Pink 2	3.05 bags
Manville blowing wool	3.20
Energlass (mineral wool)	4.35
Cellulose	5.88

Based on the range of prices quoted in the last issue, the cost per sq.ft. per R value for these insulation products is as follows:

Fiberglass Super-Pink \$	0.55- .60/sq.ft./R
Manville blowing wool \$	0.582- .63
Energlass	\$ 0.393
Cellulose	\$ 0.499- .576

Sir,

I would like to compliment you on the article titled "Insulation Costs", since price per R value is one angle I have explored in the design I am working on.

Another angle I am hoping you can help me with is the system cost. For instance, the price per square foot of a 2x4 wall (Glasclad, batt insulation, siding, drywall).

Or an 8" Sparfil\* block, with EPS inserts and left with its surface bond cost for an interior and exterior finish. I have found the price of this wall system is \$7.79 per sq. ft. for material and labour.

Would you have any information on the 2x4 wall for comparison?

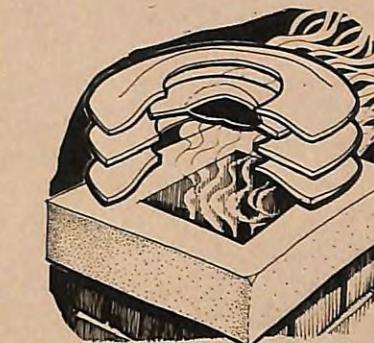
Bob Hutchinson  
Kingsville, Ont.

\* Sparfil International Inc., 5 Veronica Street Box 235, Cobourg, Ontario, K9A 4K5, (416)372-6853

We will try to explore the cost of total systems in a future issue. The difficulty with that type of analysis is the many variables that make it difficult to determine costs for accurate comparison. They depend on many possible material costs and discounts as well as a variety of labour costs.

We would welcome comments on this topic from any readers that may have done work on this topic.

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## BEYOND THE RAIN SCREEN: DRAINING EXTERIOR SHEATHING

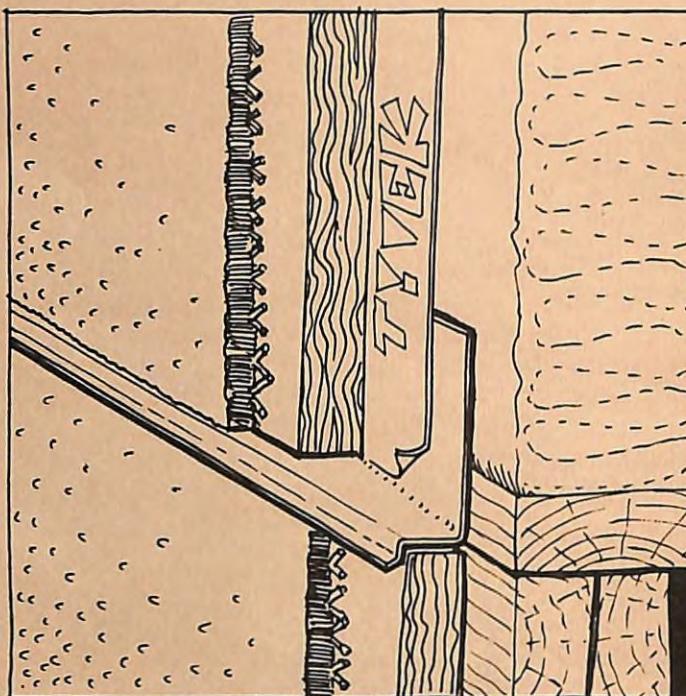
Our item on the rain screen principle (SOLPLAN REVIEW No. 18) prompted Mario Kani of Toronto to send this item.

In practical terms the air space in a rain screen wall lowers the pressure differentials and minimizes air velocities compared to those experienced on the outside surface and within the 'screen material' (e.g. brick veneer), thus minimizing water penetration. Some water will pass through the screen material but the driving forces have been reduced below that required to propel liquid water across the air space. As a result, the water runs down the back of the screen material to the flashing. As well, allowing for drying on both sides of the exterior cladding will minimize warpage and other differential moisture problems. Wouldn't it make sense to fill this cavity with insulation if the rain screen principles were maintained?

Draining high-density rigid fibre glass board (Baseclad) is already used extensively to keep basement walls dry. Glasclad is a semi-rigid glass fibre that has been bonded to Tyvek for use as an exterior insulated sheathing. Adapting these two concepts and combining them with the rain screen principle led us to try the following construction technique.

On the exterior of the wood frame walls:

1. Install flashing at the base of the wall.
2. Wrap the above grade walls with a vapour permeable air barrier, such as Tyvek, lapping it over the base flashing.
3. Attach 1½" medium density commercial rigid fibre glass board (e.g. AF530) to the exterior of the building.
4. Apply exterior cladding or "screen" material, e.g. wood siding, stucco or brick veneer. Wood siding and stucco lath can be nailed directly to the studs; brick ties need to be poked through the insulation.

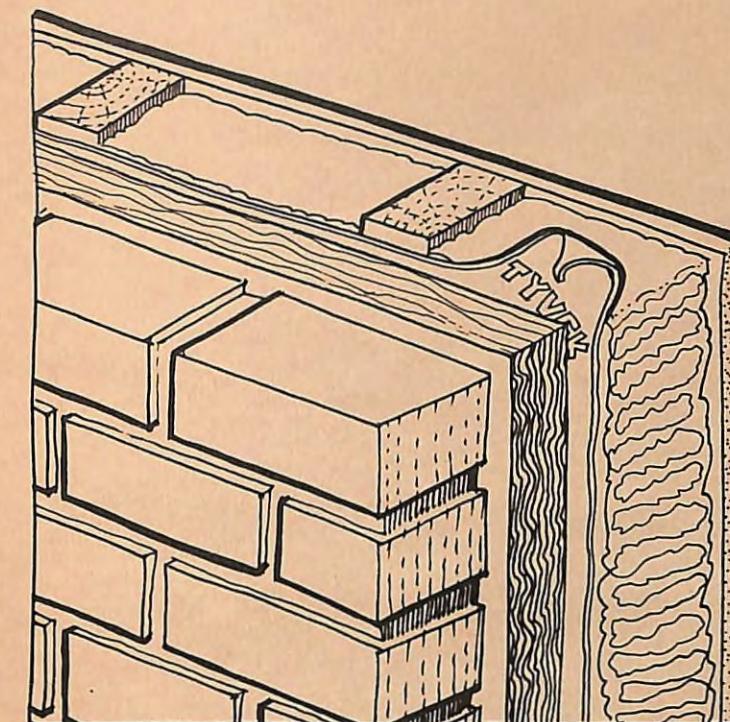


There are a number of advantages to this strategy. Firstly, the structure of the glass fibre board allows for the air pressure and velocity reduction and drainage characteristics required for rain screen performance. Further, Tyvek acts as a second defense against water, but none is likely to ever reach it. Unlike Glasclad, large sheets of Tyvek are used and taping labour is kept to a minimum, using only about  $\frac{1}{4}$  of the tape.

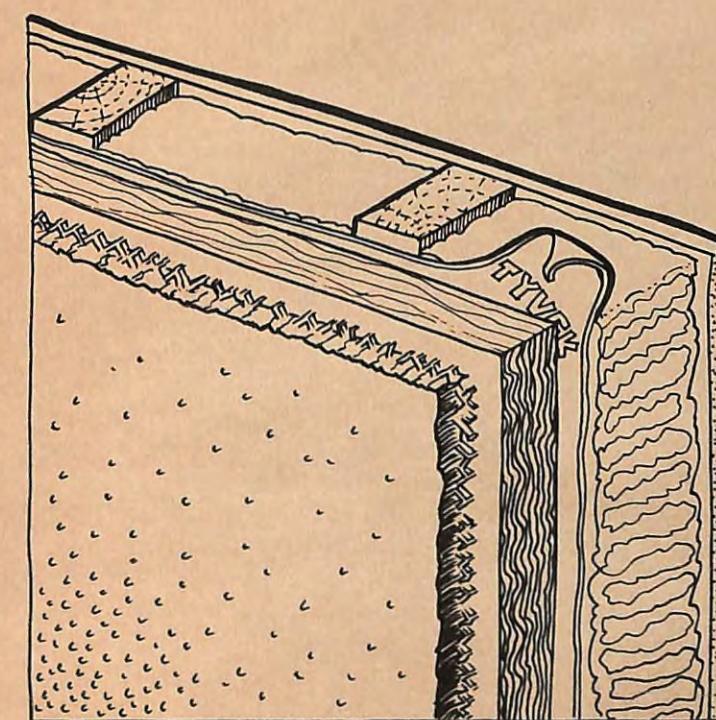
Material costs are also lower. The board insulation costs about \$0.37/sq.ft. and Tyvek \$0.11/sq.ft. for a total of \$0.48/sq.ft. vs. \$0.58/sq.ft. (including \$0.03/sq.ft for the tape) for Glasclad.

This combination provides a warmer, vapour permeable weather barrier, thus lowering the potential for condensation of interior moisture and displacing the need for chipboard or plywood (if diagonal bracing is used). The continuous exterior insulation creates a thermal break and with 2x6 framing gives an R-value of 27 (RSI 4.75).

With brick veneer, the rigid fiberglass insulation board does not allow mortar to fall to the bottom of the cavity to plug up the weep holes. This is a practice being



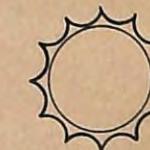
used in commercial construction, typically using a lower-cost, low-density board, in effort to avoid poor drainage, which could result in destruction of the brick and water penetration into the wall assembly or building interior.



I have used this technique on my own house (which is a low-energy radical retrofit\*) and, somewhat unintentionally, the concept is being put to a torture test. We ran out of warm weather last year and were not able to stucco the exterior, but the house is surviving the winter simply wrapped in Tyvek and the glass fibre board. It is exposed to the weather without any cladding to buffer it, yet keeps the studs dry. Not only that, Tyvek degrades with prolonged UV exposure (it is recommended that it be covered within a month). In our situation, not that uncommon in Canadian construction, the Tyvek would have been exposed for months, save for the fibre glass board.

\* A radical retrofit: Take an existing brick bungalow, add a second storey, retrofit the exterior (including low-e, argon gas filled windows) and turn it into a house that consumes 17,000 kwh per year (space and water heating). Mechanicals are handled by the first installation of the INTEGRATOR, a not-yet-available heat-pump based system providing space and DHW heating, space cooling, and ventilation with heat recovery. Gains from exhaust air, solar and grey water are stored in an ice/water phase-change thermal storage tank for eventual satisfying of heating demands.

Mario Kani is a Toronto engineer, partner in the engineering firm of Allen Associates.



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## MOISTURE STUDY

Moisture damage to wood frame housing is always a concern; proper use of materials, good construction techniques and details will avoid many of these.

Moisture damage seems to be a constant problem with wood-frame housing in Atlantic Canada. Much effort has been spent to try and resolve it. A major study involving the housing industry (with funding by CMHC) is nearing completion. Included in the work were field investigations and tests in Fredericton, N.B., Halifax, N.S., and St. John's, Nfld.

In addition to inspections of existing houses, eight different wall types were built and installed in a set of test huts, one each on the south and north walls, each simulating different wall construction types. Wall types studied included:

- furred and non-furred, wafer-board sheathed walls
- furred and non-furred, semi-rigid fiberglass sheathed walls
- furred and non-furred, extruded polystyrene sheathed walls
- wet spray-on cellulose insulated walls
- expanded polystyrene insulated walls.

The study tried to determine how easily the wall could dry out. To ensure that the drying performance could be measured properly, the walls were built of lumber having a moisture content above the fibre saturation level of wood (26-30%). It was noted with interest that the lumber supplied for the construction of the wall panels was acquired from local building supply dealers and no pre-conditioning was required, as all of the lumber was above the required 26% moisture content!

In other words, all the lumber bought on the open market was saturated - not even 'seasoned' (which is air dried of lumber).

Observations made during the study included:

- Framing lumber surveyed in Atlantic Canada typically had a moisture content of over 19% and, in most cases, exceeded the fibre saturation moisture content.
- All forty-eight test panels started to dry out during the

monitoring phase - south walls drying more than north walls

- Test panels with sheathing systems permeable to water vapour dried more quickly than those with less permeable sheathing.
- An analysis of the data collected showed that the permeability of the sheathing to water vapour was a significant factor in the rate of drying and the moisture content of the test panels at the end of the study period.
- Most test panels which stayed wet for an extended period of time showed some fungal growth on the framing lumber and wood-based sheathing material.
- The frequent occurrence of conditions allowing condensation on the back of the siding suggests that the use of furring strips may help to prevent moisture accumulation in wood and wood-based siding and sheathing materials.
- Water penetration from the exterior, due to poor detailing, poor installation of siding and flashing, plus lack of regular maintenance, were frequent factors in walls damaged by moisture.
- Many of the houses visited exhibited mould, mildew and condensation on the interior surfaces of exterior walls. The troubled areas had a relatively low temperatures.

A final report is expected to be released in the Spring of 1988. However, because of the sensitive nature of the study and its findings, there is some concern about how this should be presented. It is expected it will include specific conclusions and recommendation.

## WET BASEMENTS

There have been many cases of wet basements in new homes in Manitoba. Similar problems could exist in other areas with humid summers and long cold winters. The moisture damages floor coverings, furnishings, wall finishes, and other possessions kept in the basement.

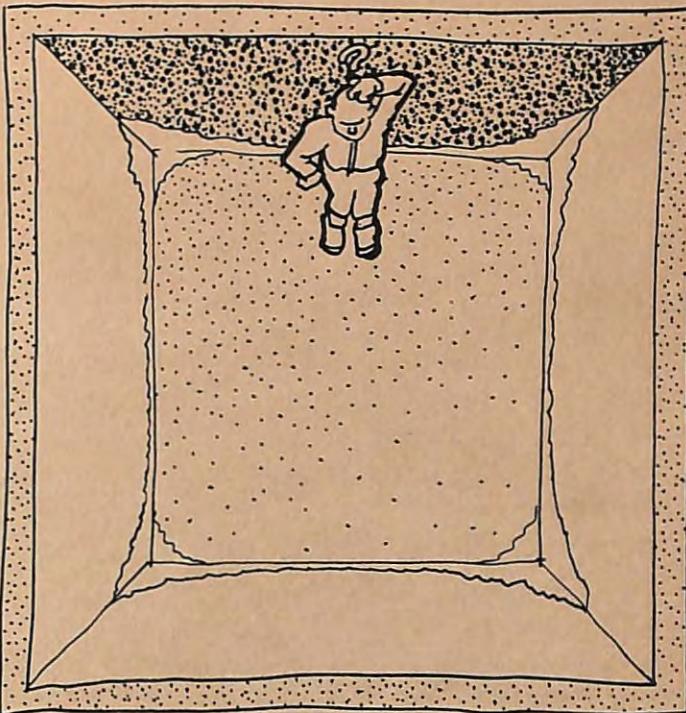
A field study of several Winnipeg houses was done between May to September 1987 to determine the causes of excessive basement condensation in new homes; to recommend appropriate remedial action; and to suggest construction practices which would avoid or reduce such problems. The houses studied were built between 1984 and 1987 to current codes, and represented conventional construction practices. This included full-height interior insulation of the foundation wall, covered with polyethylene which was stapled in place without caulk.

Two houses were more than 30 years old and typical of houses which have operated satisfactorily over many years. Two were built in 1986 with foundation insulation on the exterior. One test house was started and completed in the summer of 1987.

Site inspections suggest that many Winnipeg houses, old and new, operate for part of the year with some interior concrete surfaces cool enough to cause condensation, although little or no condensation occurs. (While Winnipeg has a long cold winter the summer can be very hot and humid).

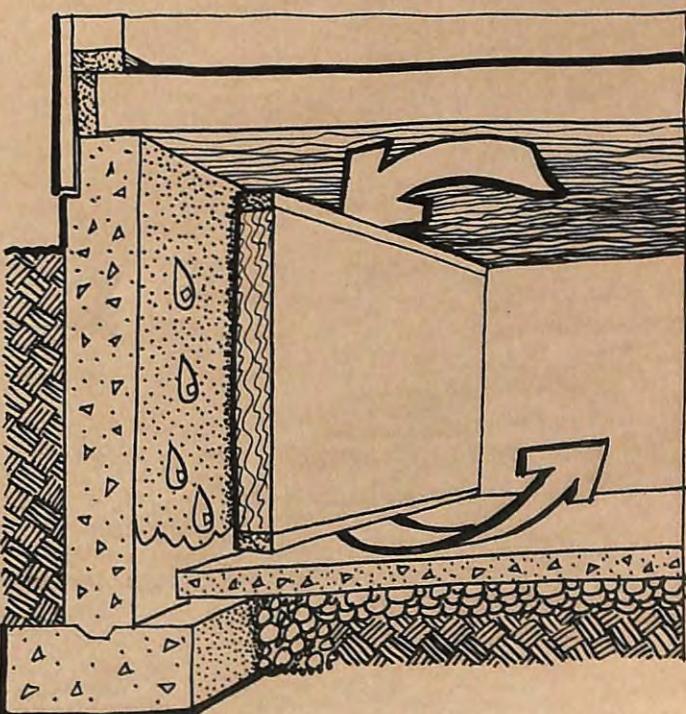
However, new houses built during cold weather to standard building practices, with basement insulation applied on the interior over the full height of the concrete foundation wall, are sensitive to serious condensation problems. The problem is worst during the first summer of occupancy.

The difference appears to be in the amount of drying experienced by the concrete since the time of construction. The practice of insulating the foundation on the interior for the full height and applying a vapour-retarding membrane is recent, and appears to have slowed down the normal drying process of concrete. Typically in older houses the concrete would have been exposed for some time before insulating, thus allowing the concrete to dry out.



The most likely source of moisture in the new houses is:

- a) humid basement air from new building materials or occupancy, which migrates to and condenses against the cool foundation wall because of the incomplete air/vapour barrier (which is



## BOOK REVIEW

stapled in place according to local building practices). b) unbound water given up by the fresh concrete, as it cures and dries.

Older 'dry' (non-saturated) concrete has some capacity to absorb and store moisture from the air contacting the wall not unlike the behaviour of wood (which can absorb water, and release it later when conditions change).

In new houses where basement condensation has occurred, it is recommended that the framed wall be opened up to expose the concrete. Good drying conditions should then be provided (in the basement) for at least one month and preferably for several months before the interior framed wall is restored.

When the interior wall is refinished after the concrete has had a chance to dry out a properly sealed air/vapour barrier should be installed. This is to ensure that summer condensation problems or winter ice build-up will not recur due to humid interior air reaching the cool concrete.

Basement condensation could become a common problem in other areas as full-height insulation becomes standard practice. Where the concrete wall is to be insulated on the interior, it should be left exposed as long as possible after construction before finishing the interior (although it could be framed at the time of construction).

Other suggestions to mitigate or prevent basement condensation in new homes include:

1. insulate foundations on the exterior,
2. maintain low interior moisture levels during winter construction by controlling the amount of water used inside the building shell during construction. Avoid bringing damp materials into the house and use construction heaters which produce less moisture than the propane-fired units now commonly used.
3. install a properly sealed air/vapour barrier in the basement,
4. if it is not practical to provide a sealed air barrier, provide a barrier to air flow somewhere along the flow path of air through the wall cavity.



### RESIDENTIAL HEATING SYSTEMS

The way we heat and cool houses is changing dramatically. Equipment now being installed in new and existing houses bears little resemblance to that installed 20 years ago. The next 20 years may bring similar advances. The changes that have taken place are the result of advanced technology. Engineering innovation has created the ability to provide environmental control with greater efficiency, safety, and economy.

In many new homes, the required space heating capacity is not much greater (or perhaps even less) than the capacity for domestic-water heating. To avoid discomfort and off-cycle efficiency losses of oversized systems, small central heating systems are needed, integrating space heater and water heater into a single unit.

**Residential Heating Systems**, is a new hands-on guide to selecting, designing, and installing heating systems. It covers: high-efficiency furnaces and boilers; integrated systems; duty cyclers for houses; electric radiant ceiling heat; selecting the 'best' heating system; and high-efficiency heating system reference chart.

The book discusses mechanical system technologies, explaining how they work, potential drawbacks and benefits, and applications. Exaggerated or unsubstantiated manufacturer claims are noted.

Also included is a section that leads a designer or builder through a step-by-step process to determine what system or combination of systems will be the most

appropriate for a particular house. This process includes factors such as:

- \* Design heating load
- \* Fuel type
- \* Air conditioning
- \* Central heating vs. in-space heating
- \* Heater type
- \* Ventilation
- \* System configuration
- \* Furnace type

A comprehensive listing of US high-efficiency residential oil and gas-fired boilers and furnaces with an annual fuel utilization efficiency of at least 81% is included.

## INDUSTRY SURVEY

A strong resale housing market, continued strength in the new home market, plus a booming home renovation and repair sector are predicted for 1988. This was the conclusion of Pulse '88 a survey of 405 out of the 539 delegates attending the Annual Conference of the Canadian Home Builders Association Annual Conference in Calgary.

Builders in Alberta and British Columbia are most optimistic about an increase in sales, while Quebec, Ontario, Manitoba and Saskatchewan predict new home sales will decline. About two-thirds expect their business to increase, largely because of the booming renovation and repair industry. Most financial institutions expect to write more mortgages in 1988 than in 1987 for new and resale homes, although 24 percent expect no changes.

Almost none of the builders say their primary markets are first time and affordable home buyers; most are targeting the more affluent move-up buyer. Only 10 percent report they are targeting the first-time home buyer.

Builders pursuing the move-up market are concentrating on kitchens, bathrooms, family rooms and special features such as improved windows and upgraded insulation as part of their base price.

Home buyer interest in energy efficiency in the new home remains high; 43% of builders report an increased interest in energy efficiency among new home buyers.

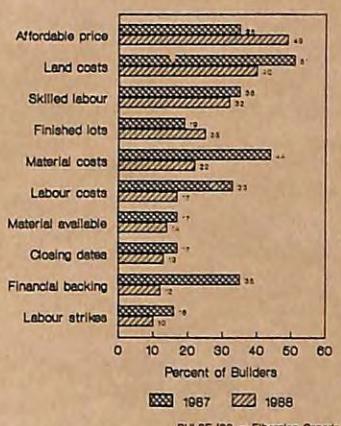
The most common energy conserving features included in the base house price are insulated doors, windows and extra insulation. Upgrade options include heat

The information contained in this book may be available from other sources (including many utility customer bulletins). However, this book combines essential basics for a variety of systems into a single readable reference. The product references may be of limited use to Canadian builders.

54 pages  
US\$ 30.00 (US\$35.00 outside North America)  
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### HOMEOWNER ISSUES - Very Concerned -



pump/HVAC, clock thermostats, additional insulation and insulated air ducts.

Although 78 percent of the builders expect prices of the homes they build in 1988 will be higher than in 1987, there is less concern over rising prices and shortages of labour, materials and land. However about a third of the builders are very concerned about the availability of skilled labour.

Renovators are among the most optimistic of all. Two-thirds report that business in 1987 was better than in 1986; and almost all (83%) project an increase in sales. Half the work they carry out involves improving energy conservation in the home, and that this is an increase over the past year.

"The Pulse '86 and Pulse '87 CHBA Polls were accurate predictors of housing starts over the past few years. The poll provides an indicator of where the Canadian building industry is going over the next 12 months.

## HUMIDITY SAMPLER

A new tool to measure average humidity for a period of up to a week has been developed. It will be of interest to those doing detailed building monitoring.

The humidity sampler provides one time, time-averaged absolute humidity and relative humidity values. Its advantage over more complicated equipment is convenience, compactness and economy. The samplers are the size of a test tube and cost less than \$15.00 per unit. A number of units can be used economically for simultaneous multi-zone studies. They complement other meters which require knowledge of humidity level for accuracy.

Use is as simple as uncapping the sampler and mounting it in position with an attached adhesive backed clip. At the end of the sampling period, the unit is

recapped and forwarded for lab analysis (the cost of which is included in the original purchase price).

The sampler operates on the principle of water adsorption by a molecular sieve. The absolute humidity is determined from the sampler weight gain and exposure period. An approximation of ambient temperature permits the derivation of relative humidity. The concept is based on preliminary work by the Lawrence Berkeley Laboratories in the USA.

It was developed as a tool for air quality studies.

### For information:

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Ottawa, Ont. K1J 8X7  
Tel: 613-748-3762

## LEBCO COMMENTARY

The latest revision of the National Building Code incorporated significant changes requiring increased tightness for the building envelope and mechanical ventilation.

Readers of SOLPLAN REVIEW, being on the forefront of building technology, will generally have few problems understanding the reasons for the changes, and how to deal with them. Unfortunately, the reaction from the building industry at large points out the sorry state of the industry.

The situation in B.C. is not much different from that in other parts of the country: in a word it's chaos.

The sad point is that not only are builders confused about how to respond and what do, but most building authorities do not know what to do, or even understand the underlying reasons why the code changes were introduced in the first place.

In B.C. lobbying pressure is being mounted to backtrack, and revise the code by eliminating the ventilation clauses. This is being supported by many builders and some building authorities. It happened in Ontario, where the ventilation requirements were left out of the code (before the code has implemented), although improved

tightening and draftproofing requirements were kept in.

Unfortunately, some of the arguments that have been raised against the entrenchment of a ventilation standard are technically wrong.

One can understand a builder in the field not having the knowledge and understanding of the issues. The vague code language does not make things easier for him. However, the underlying need to maintain a safe and comfortable indoor environment is still there. But it is unforgivable that building authorities, who, after all, are responsible for drafting and administering the code lack the technical expertise.

In some respects, the problem has been caused by underfunding of the administrative agency responsible, so it lacks the resources and technical support needed to do a proper job to resolve and educate the building community properly before chaos and confusion sets in. The builder in the field has too many concerns to worry about. He does not need the aggravation at the last minute to try and figure out how to meet new requirements that even the local building inspector can't explain to him.

## HABITAIR

Two years ago Fiberglas Canada Inc. (FCI) started promoting HABITAIR, an integrated mechanical system (Solplan Review No.7). It is Swedish Technology purchased for the North American market. 30 imported units were put into homes for field trials. Problems were noted and refinements for our climate have been made.

500 units are expected to be produced in 1988 in Sarnia, Ontario, with an increase in 1989, when exports to the U.S. will likely begin.

Habitair is a mechanical unit that provides ventilation, heat recovery, hot water, space heating, and some cooling. It is a key component of FCI's building system for low energy houses, which uses the dynamic wall principle (SOLPLAN REVIEW No. 14). The house is designed to be slightly leaky, and the minor leaks are put to work.

The homes are not built to R-2000 Program airtightness levels but simple techniques provide a reasonable level of air sealing. Windows are sealed to Glasclad sheathing, Tyvek is wrapped around header joists, and all penetrations through exterior walls are sealed. Drywall is continued behind partitions, plates gasketed, and joints on the exterior sheathing taped. Although a polyethylene vapour barrier is installed, it is not caulked.

A central exhaust fan (part of Habitair) maintains a 10 pascal negative pressure in the house. Stale, humid air is exhausted outside. This results in fresh air slowly leaking in through the Tyvek covering on the Glasclad. As the cold fresh air moves slowly through the thick mass of insulation, it is pre-heated. This inward movement of cold dry air also helps keep the structural timber dry. At least that is the principle.

We are not yet convinced that in reality the placement of leakage points can be guaranteed to be evenly distributed around the house, so there is no certainty that fresh air supply will be evenly distributed.

We are concerned that the system must keep the house at a negative pressure in order to function properly. What will its impact be on houses with combustion appliances (fireplaces, wood stoves)? Unfortunately most homeowners insist on these features.

The draft CSA Standard on residential ventilation suggests that houses with open combustion appliances should not be depressurized by more than 5 pascals. FCI spokesmen suggested that a separate make-up air duct could be provided to reduce the pressure on the wall, but this does not deal with the issue of fresh air distribution through the house.

During 1988 Fiberglas Canada will focus Habitair marketing in areas of Ontario and Quebec where electric space heating use is highest and to establish a dealer network of approved heating/air conditioning contractors to provide local installation and service.

Habitair consists of two modules: a heat recovery module which incorporates an air-to-water heat pump and a hot water tank, and an air distribution module which contains a hot water fan coil and ductwork switching assemblies (to switch from heating mode to cooling mode).

The heat recovered from the exhaust air stream is used to heat the domestic water first, then provide space heating, so the unit will not provide all the space heating requirements.

### For information:

Contact your local Fiberglas Canada Inc. representative or:  
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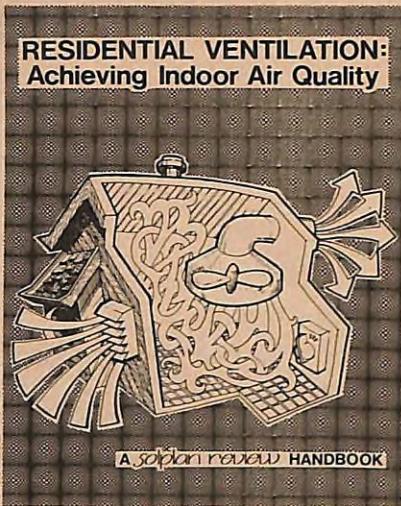
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## RESIDENTIAL VENTILATION: Achieving Indoor Air Quality

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